

**HURDLES TO HERD IMMUNITY:
DISTRUST OF GOVERNMENT AND VACCINE REFUSAL**

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ABSTRACT

More children have been granted nonmedical exemptions from required vaccinations in recent years in the United States. While the majority of the population quietly benefits from high vaccination rates, there exists a small (but growing) raucous minority of opponents who refuse vaccination and are incredibly vocal in society. Underlying this minority antivaccine ethos is a sense of distrust of the government and in healthcare providers. This distrust influences where parents obtain their vaccine information and further serves as a filter that colors immunization resources from healthcare providers or government agencies with a layer of skepticism and suspicion. Parents who distrust the government or their healthcare providers are less likely to vaccinate their children fully and more likely to seek out complementary/alternative medicine (CAM) practitioners or antivaccine websites for vaccine information. These antivaccinators do not change their decisions about vaccination when confronted with scientific information on vaccine safety and the dangers of vaccine-preventable diseases. New modalities for delivering pro-vaccine messages need to be researched. Innovative techniques to reach this distrustful population could include vaccine negotiation training for healthcare providers, specifically emphasizing the importance of gaining trust. Local initiatives to create parental peer advocate programs for vaccines through school Parent-Teacher Associations, professional groups, or religious groups could better access the antivaccine population. Increased collaboration between public health officials and CAM practitioners may also improve vaccination rates.

INTRODUCTION

National vaccination programs have successfully reduced many preventable infectious diseases in the United States, even achieving regional eradication in some cases such as smallpox and polio.¹ All 50 states have legislation requiring immunizations in schools, and these policies are largely responsible for maintaining the herd immunity required to protect the population from outbreaks of preventable infectious diseases. However, more children have been granted nonmedical exemptions (NMEs) from required vaccinations in recent years. The number of NMEs increased from 2005-2011 (**Figure 1**),² and the annual rate of increase in this time period (incidence rate ratio [IRR], 1.12) was higher than that from 1991-2004.² This means that the number of NMEs being granted increased each year, and the rate of increase also grew. Notably, Omer found that the states with easy exemption policies, where exemptions required parents to simply sign a form obtained from the school, had 2.31 times the rates of exemptions as states with difficult exemption policies, which required that forms be notarized, signed by a state official, obtained from the health department, or accompanied by a letter.³

Figure 1

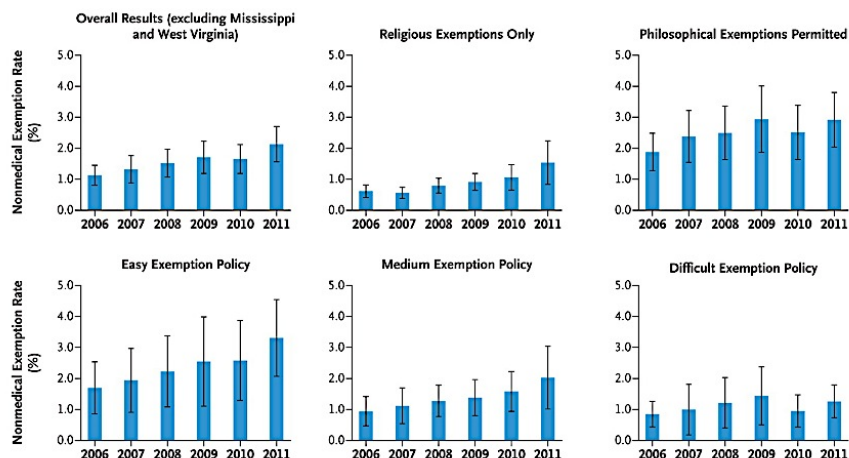


Figure 1. Rates of Nonmedical Exemptions from School Immunization, According to Type of Exemption and Ease of Obtaining One, 2006–2011.

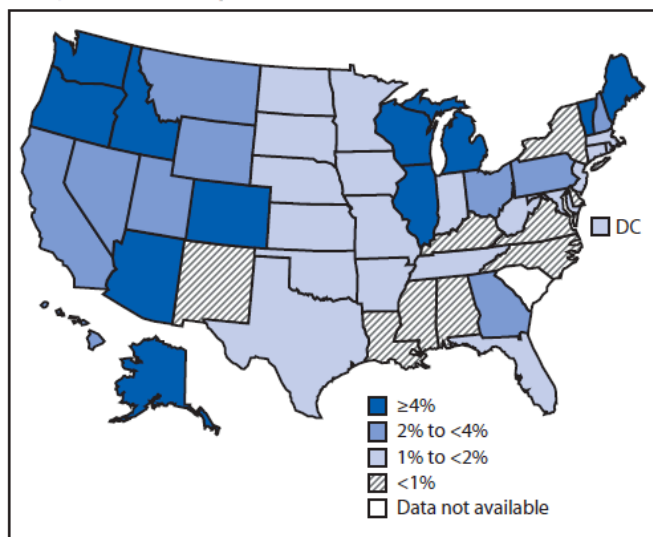
Overall mean rates of nonmedical exemptions per year for 48 states and the District of Columbia (excluding Mississippi and West Virginia, which do not allow nonmedical exemptions), as well as the rates for the types of exemptions allowed (religious reasons only and philosophical reasons permitted), are shown for the years 2006 through 2011 (top row of graphs). Mean rates of nonmedical exemptions per year according to the level of difficulty (easy, medium, or difficult, as modified from the criteria described by Rota et al.²) of the exemption policies are also shown (bottom row of graphs). I bars represent 95% confidence intervals.

Rota found that in many states, the process of obtaining a nonmedical exemption from vaccination requires less effort than actually fulfilling the state's immunization requirements.³ With policies such as these, it is no surprise that a small wave of vaccine hesitancy spreading throughout a population can quickly turn into a high percentage of unvaccinated children.

The map below from the CDC Morbidity and Mortality Weekly Report shows that kindergarten vaccination exemption rates are above 4% in some states (**Figure 2**).⁴

Figure 2

FIGURE. Estimated percentage of children enrolled in kindergarten who have been exempted from receiving one or more vaccines* — United States, 2012–13 school year



* Exemptions might not reflect a child's vaccination status. Children with an exemption who did not receive any vaccines are indistinguishable from those who have an exemption but are up-to-date for one or more vaccines.

"The figure above shows the estimated percentage of children enrolled in kindergarten who have been exempted from receiving one or more vaccines in the United States during the 2012-13 school year. An estimated 91,453 exemptions were reported among a total estimated population of 4,242,558 kindergarteners. Overall, among the 49 states and District of Columbia that reported 2012-13 school vaccination exemptions, the percentage of kindergarteners with an exemption was <1% for nine states and >4% for 11 states (range: <0.1% in Mississippi to 6.5% in Oregon), with a median of 1.8%."⁴

While this may not initially seem alarming, the state level percentages do not capture the geographic clusters of exemptions. Locally, in certain towns and schools, the percentage of unvaccinated children can be far higher than 4%. For example, the California Department of

Health 2013-2014 report shows that at the private kindergarten at the San Francisco Waldorf School, 84% of their students were not fully vaccinated at enrollment.⁵

High vaccination levels are of great public health importance, because they are necessary to maintain herd immunity. Herd immunity is a phenomenon that occurs when a population contains a certain quota of protected individuals (either from vaccination or previous infection and recovery), so that the disease is unable to spread due to the very low probability that an infected individual would encounter an unprotected individual. The percentage of the population who need to be protected from the disease to achieve herd immunity varies depending on the infectiousness of the disease, the route of transmission, the vaccine's efficacy, and the degree of contact between individuals in the population.⁶ Herd immunity is extremely important to protect individuals who cannot be vaccinated and become personally immune or those who have been vaccinated but have lost their immunity due to a compromised immune system. These individuals include infants who are too young to be vaccinated, pregnant women who cannot get certain vaccines, and immunocompromised people, such as those undergoing chemotherapy, HIV+ individuals, or transplant patients.⁷

The remarkable success of vaccines has backfired in a sense. As an effective vaccine causes disease rates to decrease, the value of the vaccine experiences a “dilution of benefit.” For example, the MMR vaccine does not feel as beneficial psychologically if you do not observe cases of measles, mumps, or rubella as common or threatening. Instead, adverse side effects of vaccines are perceived to be the more pressing threat as they grow more publicized, and loss of confidence in the vaccine can spread. Poland and Jacobson propose

Figure 3

Antivaccinators' Voices - 1

"But in my quest for more natural living, I was introduced to an online community of parents refusing to vaccinate. Between their passion and their research, I couldn't help but listen."
-Robin Konie, Thank Your Body blog author,
<http://www.thankyourbody.com/why-we-chose-not-to-vaccinate-our-child/>

that a “pyramid effect” causes this loss of confidence. In this model, the base of the pyramid is made up of the majority who quietly benefit from the vaccine while the top of the pyramid represents a small (but growing) raucous minority of opponents

who either have been harmed or perceive harm and are incredibly vocal in society.⁸ Whereas the top of the pyramid once existed as a quiet minority, people within this demographic today are able to spread their ideology more rapidly than ever before. The ease with which individuals can now publish their thoughts online allows this minority to reach a large audience without any third-party authentication, often resulting in the propagation of empirically incorrect information presented as scientific fact (**Figure 3**).^{9, 10}

What are the factors that affect the decision-making of this small vocal minority, contributing to a growing national antivaccine ethos? A desire to address this question served as the foundation for this project. Although many studies have previously investigated the role of safety concerns, misconceptions about disease risk, and beliefs that vaccines are ineffective as the major contributing factors in vaccine refusal, none have yet to deeply examine how parents feel about the government and how this may affect the health decisions they make for their children. In the US, state government mandates for required immunizations in school children has punitive consequences, where parents who do not fully vaccinate their children and do not acquire exemption status are barred from sending their children to public school. This vaccine policy structure is prescriptive rather than

"promotive" as in countries like the Netherlands, where compliance is encouraged and not required; this distinction is believed to be a potentially influential factor on population level vaccine acceptance.¹¹ Antivaccine groups have reacted to the increasing number of vaccines that the government requires for public school attendance with suspicion and resentment and often cite it as a reason they do not vaccinate.¹⁰ Distrusting the government may be a significant factor underlying why parents oppose immunization. This distrust may influence where parents obtain their vaccine information and further serves as a filter that colors government-provided immunization resources with a layer of skepticism and suspicion (Figure 4).¹²

Many studies have found that distrust of healthcare providers is a factor associated with a parent's decision not to vaccinate his/her children fully,¹³ 14, 15, 16, 17, 18, 19, 20. This distrust was fueled

Figure 4

Antivaccinators' Voices - 2

"Isn't it the FDA's job to protect us? Don't count on it. It's your job as a parent to protect your child and no one else's. The government looks out for the best interest of the country as a whole, not the individual, and most decisions are money driven. What's good for the whole is not what's best for the individual. Take vaccine injury lawsuits for example. They put a cap on how much you can sue Big Pharma for vaccine injury related deaths - \$250,000. On certain vaccines, they recently blocked any lawsuits from being filed. Why? Because they knew there would be lawsuits, and that if they allowed them, the pharmacy that made them would go bankrupt and the government would have no company left to make the vaccines that they need for military personnel and to protect the country from biological warfare. That doesn't give me a warm fuzzy feeling about vaccines or the government's job of protecting us." - Sheri Davis, All Natural Mom blog author, <http://www.allnaturalmomof4.com/2009/06/why-we-dont-vaccinate.html>

in part by a belief in conspiracy by those advocating for vaccines. Trust in the biomedical system and technology at large in addition to trust in health services personnel has been found to be essential to create an environment of vaccination acceptance ²¹. Poor staff communication and demeanor were also found to affect vaccine acceptance ²². Distrust of

healthcare providers is undoubtedly a key factor underlying some antivaccinators' decision-making process. This distrust may predispose parents to be disbelieving of pediatricians' advice and lead them to seek alternative medical practitioners for care provision and vaccine information.

RESEARCH QUESTIONS

How does trust in government and healthcare providers relate to vaccine refusal and other parental health and safety beliefs? Where do parents who distrust the government or their healthcare providers get their vaccine information?

The statistical analysis will be based on the following set of specific secondary questions:

"Are parents who distrust the government or distrust healthcare providers..."

- More likely not to fully vaccinate their children?
- More likely to distrust government sources of vaccine information?
- More likely to distrust vaccine advice from their healthcare providers?
- More likely to believe immunizations are harmful and unsafe?
- More likely to see complementary/alternative medicine practitioners and more likely to trust their advice about vaccinations?
- More likely to oppose school immunization requirement laws and mandatory vaccine registries?
- More vigilant about safety decisions in general and more likely to avoid preservatives in food or have their children always wear a helmet on bikes and a seatbelt in cars?

BACKGROUND

LEGISLATIVE HISTORY

The United States Constitution carefully designates which powers are reserved for the federal government and which powers remain in the hands of the states. The states have certain "police powers" granted in the Tenth Amendment, essentially including all rights and powers not explicitly assigned to the federal government. These rights include the power to make and enforce laws to protect the welfare, safety, and health of the citizens of the states²³. Therefore, laws surrounding immunization remain under the discretion of individual states.

Federal involvement with vaccine policy dates back to the Poliomyelitis Immunization Assistance Act of 1955, through which Congress provided \$53.6 million (from 1956-1957) in grants for states to purchase the inactivated polio vaccine, so children and pregnant women could obtain the immunization for free. After becoming involved in the battle against polio, the federal government expanded its focus to providing grants for diphtheria, pertussis, tetanus, and measles immunizations under the Kennedy Administration²⁴. In 1988, the National Childhood Vaccine Injury Compensation Program was established to ensure that the appropriate quantity of vaccines is maintained at stabilized prices, and to provide compensation for people found to be injured by certain immunizations (funded by an excise tax on the price of vaccines)²⁵. However, Congress has never made national laws about vaccine requirements in schools; federal bills are unlikely to pass in the near future, because vaccine requirements are typically agreed to be outside of Congress's legislative scope defined by the Constitution.

School vaccination laws and policies originated in the 1800s when various states and municipalities began requiring proof of immunization to attend public schools, largely motivated by smallpox outbreaks. These policies did not pass without a vociferous antivaccination opposition, and many laws were overturned then re-passed in these early years. Enforcement was also inconsistent; local school boards charged with the policy implementation often opposed the requirements and did not enforce them. Immunization coverage levels would typically rise during outbreaks and immediately after, then fall dramatically when no sicknesses were visible, only for the disease to rebound and strike again ²⁶. Laws were written and amended on city and state levels throughout the next two centuries to impose requirements or to include additional vaccines. Antivaccinators repeatedly challenged the legality of school vaccine laws, and ultimately the case was tried in the US Supreme Court. In a 1922 case, *Zucht v. King*, the Court held that a school could refuse admission to a student who did not comply with vaccination requirements ²⁷. Earlier, in 1905, the Supreme Court found a Massachusetts compulsory smallpox vaccination law constitutional in *Jacobson v. Massachusetts*, setting a precedent that individual freedoms must sometimes be sacrificed for the public health of all citizens as deemed necessary by the state ²⁸. It was not until 1980 that all states had immunization requirements for school attendance with the intent to prevent the spread of infectious diseases ⁶. All states currently have laws requiring some proof of immunization, though the specifications of documentation, necessary dosage, vaccine schedule, and exemption conditions vary among states. All states allow medical exemptions to requirements, 48 states allow religious exemptions, and 19 states allow broader personal or philosophical belief exemptions (PBEs).

From around 1930 until 1980, public vaccine opposition was relatively nonexistent or at least inactive. However, by the time when every state had immunization requirement laws for public school attendance in the 80s, the safety of the pertussis vaccine was being widely questioned. Anti-vaccine advocates began pushing for legal nonmedical exemptions to school vaccine requirements. Diekema proposes that anti-vaccine groups oppose immunization requirements for three main reasons: the belief (mostly misbelief) that vaccines are unsafe or ineffective, the argument that vaccines are unnecessary because the diseases they prevent are rare or not serious, and the claim that school vaccine requirements are governmental intrusions into private family life and violate individual civil liberties ⁶. Under this paradigm, distrust of government could be a significant motivating factor for anti-vaccine advocates.

DECISION MAKING BIASES

The decision whether or not to vaccinate is sensitive and complex, stimulating fear and intense deliberation for many parents. When making difficult decisions about situations that require estimations of probability or frequency, people use the speed it takes to recall something as a tool to simplify complex judgment analysis ²⁹. According to Tversky and Kahneman, when people estimate the probability of an event by measuring how easily they can recall related instances, they are using what is known as the availability heuristic. For example, someone trying to estimate the likelihood of a hurricane occurring in the next month may remember a recent hurricane and overestimate the probability that another storm will hit.

Further, preoccupation with highly desirable or highly undesirable outcomes can increase the availability of a related scenario. In other words, an outcome that is particularly positive or negative is more easily recalled than one that is more neutral. When a parent attempts to estimate the probability of his/her child having a negative reaction to vaccines, a highly undesirable outcome, the availability heuristic can bias his/her conclusion. Parents scan their brains for related scenarios, and if they can quickly recall a neighbor or friend who had a negative reaction to a vaccine or a newspaper article mentioning a vaccination side effect story, the speed of recall may provide a basis for them to overestimate the likelihood of vaccine reactions.

On the other hand, scenarios that are difficult to conceive cause underestimation of probability. Parents who search their minds and are unable to recall scenarios of people becoming severely ill from pertussis, rubella, or other vaccine-preventable diseases may be biased by the availability heuristic and underestimate the likelihood and severity of getting the disease even if presented statistics contradict their personal conclusions.

FACTORS INFLUENCING VACCINE DECISIONS

There is a significant relationship between vaccination policies and vaccination refusal rates in the United States. A recent study on pertussis in California found significant association between clusters of high rates of nonmedical exemptions to pertussis vaccines and clusters of pertussis disease cases ³⁰. In response, the national media began started discussing vaccine legislation and vaccine refusal ³¹. Many states offer nonmedical religious and personal belief exemptions (PBEs) to vaccines ³². States that offer PBEs in addition to religious exemptions have higher rates of total nonmedical exemptions than states that do

not offer PBEs. In addition, easier exemption granting processes and offering a PBE were both associated with higher rates of pertussis disease ³³. This case study has shown that when a state provides the legal opportunity for parents to opt out of vaccination, especially when parents only have to sign a form to do so, vaccine rates drop. But why are parents opposed to vaccination in the first place? My hypothesis is that distrust of the government plays a role in parental vaccine refusal and health care decision-making for their children in general.

In response to falling vaccination rates and anti-vaccination movements, a large body of research on parents' feelings about vaccination and factors affecting their decision-making has developed. Previous studies, mostly surveys, focus groups, and interviews, have contributed to a growing list of factors affecting parents decisions about vaccines. Mills summarized factors identified in 15 studies that were found to be associated with antivaccinators (**Table 1** - ²²). Mills' major findings were that many parents who chose not to vaccinate were concerned that vaccines caused short-term and long-term adverse effects, expressed distrust of the medical community, and faced access obstacles like poor communication or being unaware of the immunization schedule ²².

Table 1

Themes identified in studies

Item	Semistructured interviews [reference]										Focus groups [reference]				
	[31]	[17]	[18]	[30] ^a	[24]	[19]	[20]	[21]	[29] ^a	[22]	[23]	[25]	[26]	[27]	[28]
Sample size, $n =$	13	45	23	40	47	20	13	28	67	12	13	41	50	84	48
Believes vaccines are immunocompromising	–	+	–	–	+	–	+	–	+	–	–	–	–	–	–
Believes vaccines cause diseases	–	+	–	–	+	–	+	+	–	+	–	–	+	–	–
Risks of long-term, unknown adverse effects	+	+	–	–	+	–	+	–	+	+	–	–	+	–	–
Risks of adverse effects	+	+	+	+	+	+	+	+	+	+	–	+	+	+	+
Parents remembered their own or others' adverse experiences	+	–	–	–	+	+	+	+	–	+	–	–	–	–	–
Exposed to pathogens in clinics	–	–	+	–	–	–	–	–	–	–	–	+	–	–	–
Fear of needles	+	–	+	–	–	–	–	–	–	–	–	–	–	–	–
Vaccines are provided at too young an age	–	+	–	–	+	–	–	–	+	–	–	–	–	–	–
Painful	+	+	+	+	–	+	–	+	+	+	+	+	+	–	–
Conspiracy theory or distrust of medical community	+	+	–	–	+	–	+	+	+	+	–	+	–	–	+
Believes the diseases are not a problem	–	+	–	–	+	–	–	+	+	+	–	–	–	–	+
Believes that medical community does not understand adverse events	+	+	–	–	+	–	+	–	–	+	–	–	–	–	–
Ineffective	–	+	–	+	–	–	–	+	–	–	–	–	–	–	–
Natural immunity	–	+	–	–	+	–	–	–	–	+	–	–	–	–	+
Alternative methods of protection	–	+	–	–	+	–	+	–	–	–	–	–	–	–	–
Can control pathogens child is exposed to	–	–	–	–	–	–	–	+	+	–	–	–	–	–	–
Do not vaccinate when child has minor illness	–	+	+	–	–	+	–	+	–	+	+	+	+	+	+
Costs (financial)	–	–	–	–	–	–	–	–	–	–	–	+	+	+	–
Time	–	–	+	–	–	+	+	–	–	+	+	+	+	+	–
Office hours or waiting time	–	–	+	+	–	–	–	–	–	–	+	+	+	+	–
Transportation and location	–	–	–	–	–	–	–	–	–	+	+	+	+	+	+
Additional children need to be looked after	–	–	–	–	–	–	–	–	–	+	+	+	+	–	–
Staff are unpleasant or poor communication	–	+	+	+	–	–	+	–	+	–	+	+	+	–	–
Don't know vaccination schedule	–	+	–	–	–	+	–	+	+	+	+	+	+	+	–
Moral reasons or religion	–	–	–	–	+	–	+	–	–	+	–	–	–	–	–
Lack of knowledge of diseases	–	–	–	–	–	–	–	+	+	+	–	–	–	–	–
Reported barriers, total no.	7	15	8	5	12	6	11	11	11	17	8	12	12	7	6

^a This semistructured interview study also used focus group methods.

The studies cited in the table are: ^{13-17,19,20,34-41}. The table itself is sourced from ²².

THEORETICAL FRAMEWORK

While distrust is repeated throughout Mills' list of antivaccine factors, there is no specific mention of the government. Health decisions surrounding vaccination are highly government-regulated due to legislative vaccine requirements in public schools. Because of this strong association, I hypothesize that significant feelings of distrust toward the government affect parental decision-making and are inhibitors to vaccination.

Parents who distrust the government may be more likely to think vaccines are unsafe due in part to distrust of the testing done by the Food and Drug Administration (FDA). Parents who do not vaccinate their children often report safety concerns as a reason for their

decision. In an affluent Midwestern population of parents, fear of reactions from vaccines was associated with underimmunization, specifically when mothers had college educations and multiple children ⁴². A case-control study in Wisconsin parents showed the most common reason (listed by 57% of parents) to claim nonmedical exemptions for vaccination was that they believed the vaccines might cause harm ⁴³. Risk-benefit calculations surrounding disease risk and vaccines are often skewed in antivaccine parents. In a population of randomly selected *Mothering* magazine subscribers (respondents who were notably 94% female, 98% Caucasian, and with median household incomes between \$45,000 and \$60,000 per year), 90% of nonvaccinators thought it was more likely for their child to have long-term injury as a result of the pertussis vaccine than from whooping cough disease itself. When these nonvaccinators were presented with risk-benefit statistics that public health studies use to conclude that the risks of disease are worse than the risks of the vaccine, the parents focused on evidence that strengthened their previously held views, ignoring facts to the contrary ⁴⁴. In a national case-control study, parents of children who were underimmunized were twice as likely to report that vaccines were either unsafe or somewhat safe than parents whose children were fully immunized ⁴⁵. Distrust of government may be associated with increased concern that vaccines are unsafe, decreased receptivity to contrary evidence, and increased inclination toward not vaccinating fully.

American citizens' trust in the government has been in decline for the past handful of decades. In 2013, the Pew Research Center found only 19% of the public reported that they trust the government to do what is right always or most of the time, as compared to 73% in 1958 ⁴⁶. Poland and Jacobson hypothesized that when the public views government

mandated vaccine programs as coercive, anti-authority sentiments and distrust arise ⁸. This emphasizes the idea that the choice to vaccinate may be more closely related to perceptions of government than other health choices. As long as neglect or abuse is not an issue, decisions such as when to bring a child to the doctor's office reside solely in the parent's sphere of authority. Conversely, the choice to vaccinate is completely government regulated, from which vaccines children are supposed to receive at what ages to the process of applying for an exemption. The extensive legislation surrounding immunizations sets the stage for resentment and frustration towards the government (Figure 5 - 47).

Very little empirical data exists on how distrust of the government affects health

decisions. Whetten found that distrust of the government can affect health outcomes, given that a lack of trust in the government was associated with more emergency room visits and worse mental and physical health in a population of HIV-positive individuals ⁴⁸. This study showed that a lack of trust in government affected an individual's personal health. However, when it comes to health outcomes in children, decisions are made at a parental level on their behalf. Parental distrust may manifest differently or be magnified when making health choices for their children. Marlow showed that mothers in England who had high trust in

Figure 5

Antivaccinators' Voices - 3

"Bottom line, though? I make the decisions that are right for my child. I do. With no input from you or anyone else, unless I choose to consult them. And I'm not asking right now. I'm not willing to put my children at risk on the tiny chance that it might someday prevent another child from getting a disease (that most likely won't harm him or her). No, I don't think it's selfish to say that. In fact, I think it's selfish for people to ask me to vaccinate when I've made a decision not to. That's right — you're being selfish to try to force your will onto me." - Kate Tietje, Modern Alternative Mama blog author, <http://www.modernalternativemama.com/blog/2014/03/15/dear-vaccine-pushers-i-dont-vaccinate-and-you-cant-make-me/>

doctors or the government were more likely to accept the HPV vaccine for their children ⁴⁹. Still it should be noted that significant differences in the health system and the public perception of the British government make this study less applicable to the United States. In a survey of four states in different geographical areas of the US, Salmon established that parents of vaccine exempt children were significantly more likely to show low levels of trust in government than parents of vaccinated children ⁵⁰. With raw data from this study, I will explore the relationship between distrust of government or healthcare providers and a variety of factors related to vaccine refusal and other parental health decisions. I hypothesize that distrust of government and distrust of healthcare providers leads to a greater fear of vaccines and added skepticism of primary care provider advice and suspicion surrounding scientific evidence presented by government agencies. This can cause vaccine refusal, especially in states that offer easily accessible PBEs.

HYPOTHESIS AND OBSERVABLE IMPLICATIONS

My hypothesis is that distrust of government and distrust of healthcare providers are significant factors in parental health and safety decisions, specifically associated with:

- I. Increased rates of vaccine refusal
- II. Increased concern that vaccines cause harm
- III. Increased use of complementary/alternative medical (CAM) practitioners
- IV. Increased opposition of immunization registries and laws requiring immunizations in schools
- V. Increased use of nongovernmental, nonscientific, and anti-vaccine sources of information on immunizations
- VI. Increased bike helmet usage, increased seatbelt usage, and increased concern about food preservatives

If these six hypotheses were true, the observable implications would be odds ratios greater than one when the aforementioned variables are used as the dependent variables for a bivariate logistic regression using distrust of government or healthcare providers as the independent variable, and controlling for income, race, age, education, and religiousness.

I hypothesize that this factor of distrust of government and healthcare providers is related to many parental decision mechanisms surrounding their children's health and safety and should be considered for future research and intervention design.

METHODS

Secondary data analysis was performed on a dataset from Johns Hopkins University, from which a paper was published in 2005^{50,51}. The methods the original data collectors performed are quoted below, blocked out with the title lines, and the methods used for secondary analysis follow.

"We surveyed the parents of 815 children who, according to school records, were exempt (for any reason, including medical) for 1 or more vaccine antigens required for school entry (based on state laws) and compared them with parents of 1630 fully vaccinated children. Two vaccinated control children in the same grade and school as the case child were randomly selected per case. Children were recruited from 112 private and public elementary schools (grades kindergarten through 5) in Colorado (n=25), Massachusetts (n=23), Missouri (n=34), and Washington (n=30) that participated in an earlier survey of school immunization personnel and had 5 or more students with exemptions⁵². The earlier study of school personnel sampled 250 schools in each of these 4 states, including 150 schools per state with the highest rates of exemptions, 50 schools with the lowest rates of exemptions, and 50 schools randomly selected from the remaining schools in the state. Up to 13 exempt children were selected per school; if the school had more than 13 exempt children, 13 were selected randomly to ensure that we sampled a large number of schools and did not exclusively recruit exemptions from a small number of schools with high rates of exemptions. This study was approved by the Committee on Human Research at Johns Hopkins Bloomberg School of Public Health.

SURVEY PROCEDURES

Johns Hopkins researchers trained school personnel and nurses in the study procedures and process for random selection. Survey packets were mailed from Johns Hopkins to the school personnel responsible for immunization, who then addressed and mailed survey packets to the selected parents (survey packets were addressed “To the parent of [name of child]”). Parents consented to participate through use of a disclosure letter. Parents were requested to mail an enclosed postcard to the school indicating their willingness to participate in the study; schools then followed up with parents by letter and telephone. Completed surveys were mailed from parents directly to Johns Hopkins. Johns Hopkins researchers did not know the names of the children or their parents, and there were no identifiers on the surveys. Surveys of the parents of exempt children had exemption-specific questions that allowed researchers to identify which surveys were completed by case parents vs controls. These survey procedures allowed the schools to protect the privacy and confidentiality of the children and their parents. Surveys were mailed to Massachusetts parents in February 2002 and to parents in the remaining states in February 2003.

SURVEY CONTENT

Parents of exempt children were asked to verify that their child had not received 1 or more of the vaccines required for school entry, whether the child received the complete or less-than complete number of doses for each vaccine series, and the reasons why they chose to forgo vaccination. Parents who indicated that they did not vaccinate for medical reasons were asked to indicate the medical condition that contraindicated vaccination. All respondents were asked to use a 5-point Likert scale to estimate the probability that an

unimmunized child would contract a disease for which vaccines are recommended for elementary school children (polio, measles, mumps, rubella, diphtheria, pertussis, tetanus, Haemophilus influenzae type b, hepatitis B, and varicella) during a ten-year period (“impossible” to “very likely”), how serious it would be for an 8-year-old to develop one of these diseases (“not at all serious” to “very serious”), how effective the vaccines are in preventing children from getting these childhood diseases (“not at all protective” to “very protective”), and how safe the vaccine is (“dangerous” to “very safe”). Respondents were also asked to use a 5-point Likert scale (“strongly disagree” to “strongly agree”) to indicate their agreement or disagreement to a series of 14 questions relating to key immunization beliefs ⁵³ and who benefits from vaccination (the child, community, physicians, government, or companies that make vaccines: “not at all” to “a great deal”). The same 5-point scale was used to indicate their agreement or disagreement to a series of 11 questions that measured trust in health care professionals ⁵⁴ and a series of 6 questions that measured trust in government (addressing issues of beneficence, equity, and openness of information ⁵⁵). 1 question about whether they or their immediate family members (spouse/partner or children) had used the services of a chiropractor, acupuncturist, or other complementary/alternative medicine (CAM) professional in the past 5 years; 1 question asking about 16 information sources where they received information about vaccines and the quality of sources for vaccine information (“extremely poor source” to “excellent source”); and 1 question about the type of medical professional they considered their child’s primary physician to be. Respondents were asked to identify their age (9 categories, starting with 18-20 years and continuing by 5-year intervals, with ≥ 61 as the highest), education (6 categories

of grade completed: grade 4, grade 8, grade 12 or General Educational Development test, some college, college graduate, or postgraduate), household income (in \$10 000 intervals to \geq \$70 000), race or ethnic group, their relationship to the child (mother, father, or other), the age of the child, and whether they had other children. Surveys took approximately 30 minutes to complete; a sample is available online ⁵⁶.

PRIMARY DATA ANALYSIS

Parents were excluded from the primary data analysis if their child had been listed by the school as exempt but the parent indicated that their child was fully vaccinated or if the parent provided a plausible medical contraindication. Twenty exempt children were identified as siblings with different last names when the school addressed the envelopes (before the surveys were mailed), and older siblings were removed from the study to avoid sending a duplicate survey to the same household. Surveys were returned by 391 (48.6%) of the 805 parents of exempt children and 976 (59.9%) of the 1630 parents of fully vaccinated children, for an overall response rate of 56.1% (state range: 50.2%-64.1%).

Of the 391 parents of exempt children identified by the school, 86 reported that their children were fully vaccinated, and an additional 28 provided valid medical contraindications for vaccination. The remaining 277 parents of children with nonmedical exemptions were included as cases in the analyses; 68 children (24.5%) received no vaccines, and the remaining children had antigen-specific exemptions (Figure 1). The most common antigen not given was varicella (n=147; 53.1% of cases), and the least common antigen not given was polio (n=45; 16.2% of cases) (Figure 2).

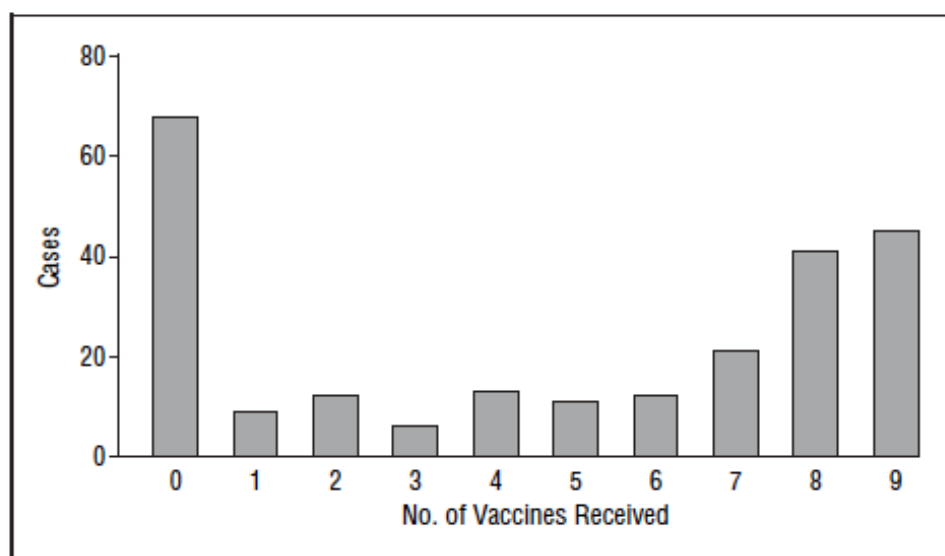


Figure 1. Number of recommended vaccines received for children with nonmedical exemptions ($n = 277$). Recommended vaccines included diphtheria, pertussis, tetanus, measles, mumps, rubella, polio, *Haemophilus influenzae* type b, varicella, and hepatitis B.

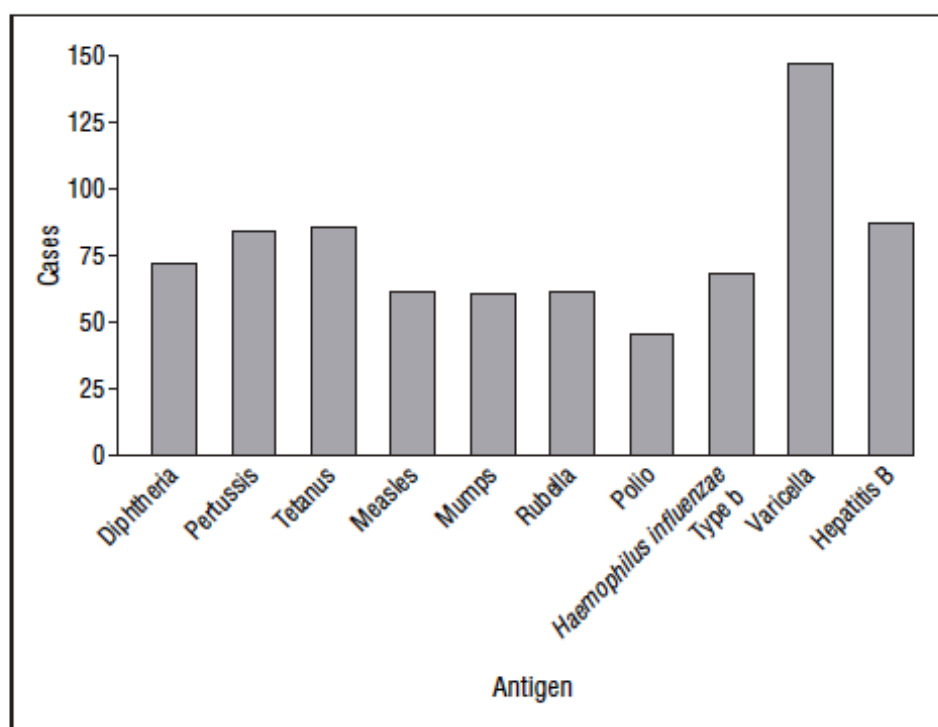


Figure 2. Recommended vaccines not received for children with nonmedical exemptions ($n = 277$).

A higher proportion of parents of exempt children were older than the median (aged 36-40 years) compared with parents of vaccinated children (44.0% vs 35.9%, respectively; $P=.02$). Parents of exempt children were more likely to have higher than the median level of education (some college) than parents of vaccinated children (57.6% vs 47.2%, respectively; $P=.02$). Parents of exempt children and parents of vaccinated children were similar in terms of income (40.6% vs 41.1% with a family income greater than the median [\$60 000-\$69 999], respectively; $P=.90$) and race (94.5% white vs 91.7% white, respectively; $P=.14$). The mean age of the children selected by the school whose parents completed surveys was 7.8 years. Surveys were completed by mothers ($n=1093$; 88.5%), fathers ($n=115$; 9.3%), and a range of other caregivers ($n=27$; 2.2%) including grandparents, aunts, stepparents, foster or adoptive parents, and legal guardians. Most respondents ($n=1061$; 87.0%) reported having other children. Respondents reported living in Colorado ($n=347$; 28.1%), Massachusetts ($n=350$; 28.3%), Missouri ($n=238$; 19.2%), Washington ($n=296$; 23.9%), and other states ($n=6$; 0.5%), including those bordering the states where schools were selected."⁵⁰

SECONDARY ANALYSIS

The secondary analysis controlled for religiousness in addition to education, income, age, and race. Education was dichotomized into two categories: higher than the median (which includes college graduate or more) or the median and lower. Income was dichotomized into two categories: higher than the median (which means over \$70,000 in total gross household income) or median and lower. Age was dichotomized into two categories: higher than the median (which includes parents 41 and older) or the median and

lower. Race was dichotomized into two categories: white or non-white. Religiousness was dichotomized into two categories: very religious (including those who attend religious services weekly or more often) and less religious for all who attend services less often.

The two main variables of interest for this analysis were distrust of the government and distrust of healthcare providers. Though the original data analysis was performed with a series of six questions, this analysis honed in on one specific statement to determine distrust of the government: "The United States government was responsible for creating HIV and AIDS." Anyone who strongly agreed, agreed, or neither agreed nor disagreed with this statement were put in the distrust category, which was composed of 504 respondents of the 1253 used in analysis. For distrust of healthcare providers, this analysis used 4 of the 11 statements used to inquire about feelings toward the child's primary healthcare provider, selecting the most telling statements: "I trust my child's health-care provider's judgments about my child's medical care," "I feel my child's health-care provider does not do everything he/she should for my child's medical care," "I trust my child's health-care provider so much that I always try to follow his/her advice," and "I trust my child's health-care providers to put my child's medical needs first when treating my child's health problems." The responses to these statements were appropriately reversed if needed and averaged. The Cronbach alpha statistic, a measurement of internal consistency between survey question answers meant to measure one outcome, was 0.8426, which indicates sufficient internal consistency between the statements. The lowest quartile of trust was categorized as those who distrust their healthcare provider, which includes 299 respondents of the 1253 used in analysis.

This analysis sought to find the difference in behaviors and beliefs of parents who trust and distrust the government and trust and distrust their healthcare providers. 8 different behaviors were analyzed (**Table 2** in Results). The first behavior is "does not vaccinate child fully" meaning that their child did not get all recommended immunizations and parents requested a PBE for nonmedical reasons. "Sees a CAM practitioner" is a behavior defined as the respondent or his/her immediate family members using the services of a chiropractor, acupuncturist or other complementary/alternative (CAM) practitioner in the last five years. "Has gotten vaccine information from a government agency" means the respondent has either sought or received information about vaccines from the CDC, FDA, or local or state health departments in the past. "Has gotten vaccine information from a healthcare provider" signifies that in the past, the respondent has either obtained or received information about vaccines from healthcare providers' advice or from printed materials from the healthcare providers' office. The behavior "has gotten vaccine information from an anti-vaccination organization" reports that the parent has at one point obtained information about vaccines from the National Vaccine Information Center or Dissatisfied Parents Together, which are two names for the same anti-vaccine organization. The group was originally known as Dissatisfied Parents Together (DPT), but has since changed their name to the more official sounding National Vaccine Information Center (NVIC). If a parent "has gotten vaccine information from a CAM provider," he/she reports obtaining information about vaccines from alternative healthcare providers at some point in the past. "Has child always wear a helmet" understandably means the parent's child always wears a helmet when

riding a bike. "Has child ride in car with seatbelt or car seat" means the parent chose "seatbelt" or "car seat" when asked how their child normally rides in a car.

For the second part of the analysis, 13 different beliefs were analyzed (**Table 3** in Results). The belief "Immunizations do more harm than good" meant parents either agreed or strongly agreed with that statement. "Disagree with the statement that immunizations are one of the safest forms of medicine ever developed" understandably signifies that the respondent either disagreed or strongly disagreed with that statement. Parents were categorized as having the belief "parents should be allowed to send unvaccinated children to school" if they answered yes when asked if this practice should be allowed. Respondents who ranked "avoiding preservatives in food" as 5 or higher on a scale of 10 of importance for their children's health were categorized as having the belief "avoiding preservatives in foods is important for children's health." Parents who were reported to believe "vaccines are not important for children's health" had ranked "vaccines" as less than 5 in an importance scale of 1-10 about how important it is for their children's health. When asked how much different groups benefited from children receiving all required vaccines, parents who selected "a great deal" next to companies that make vaccines were categorized as believing "companies that make vaccines benefit a great deal when children receive all of the recommended vaccines." Parents who were categorized as believing "immunization requirement laws interfere with parents making informed choices about vaccines" had answered yes when asked that question. When asked if they would support or oppose a law authorizing an immunization registry in their state, respondents who answered "oppose" were categorized as "opposes laws authorizing an immunization registry." A parent was

categorized as having the belief "vaccine information from government agencies is not reliable" if he/she marked either CDC, FDA, or local & state health departments as poor or extremely poor sources of accurate vaccine information. The belief "vaccine information from healthcare providers is not reliable" applied to parents who marked either healthcare providers' advice or printed materials from healthcare providers' office as poor or extremely poor sources of accurate vaccine information. If the respondent marked NVIC as a poor or extremely poor source of accurate vaccine information, he/she was categorized as having the belief "vaccine information from the National Vaccine Information Center is not reliable." If the respondent marked DPT as a good or excellent source of accurate vaccine information, he/she was categorized as having the belief "vaccine information from Dissatisfied Parents Together is reliable." Similarly, if the respondent marked alternative healthcare providers' advice as a good or excellent source of accurate vaccine information, he/she was categorized as having the belief "vaccine information from CAM providers is reliable."

This analysis used bivariate logistic regressions, controlling for education, income, age, race, and religiousness, to analyze the relationship between the independent variables of interest (distrust of government and distrust of healthcare providers) and the dependent variables, 8 of which evaluated behaviors and 13 of which evaluated beliefs. Chi squared tests were performed to compare education, income, age, race, and religiousness in trust and distrust populations. All results were analyzed on a 5% significance level using STATA.

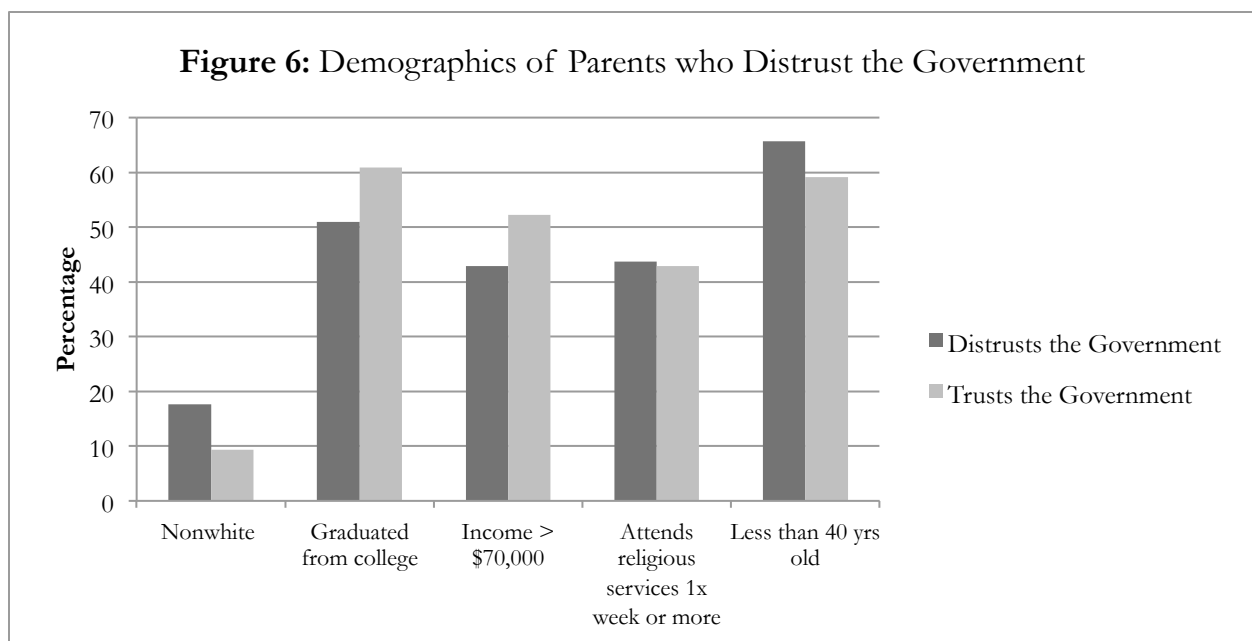
DATA

This data comes from a case-control study of 2435 parents in Colorado, Massachusetts, Missouri, and Washington, which found that parents of children with non-medical exemptions to vaccines were significantly more likely than parents of vaccinated children to report a low level of trust in the government ⁵⁰. Not all of the data has been analyzed or published, and I am very thankful to Dr. Daniel Salmon at Johns Hopkins, who has generously allowed me to work on this dataset.

This data is from February 2002 for Massachusetts, and February 2003 for the three other states. Though the data was not recently collected, this dataset is still relevant because the most recent anti-vaccine sentiments began growing near the turn of the millennium, and the surveys were conducted after the now retracted 1998 Wakefield Lancet paper connecting autism to the MMR vaccine ⁵⁷. In other words, anti-vaccination beliefs were prevalent during this time, and the current ideology behind vaccine refusal should not be starkly different from the ideology in 2002 & 2003. This data is particularly valuable as it is individual-level data linking a wide variety of parental beliefs and behaviors to their child's vaccination status and the surveys address many more variables than other studies. This study also looks at parents of school aged children while many related studies look at younger children, who may have had a delay in vaccination but later go on to be fully vaccinated, making some cases incorrectly categorized. This data also covers four different states with diverse populations and looks at both private and public schools, which makes the data more transferable to other parents across the United States. There is not another data set that looks at distrust of government and healthcare providers in the same manner.

RESULTS

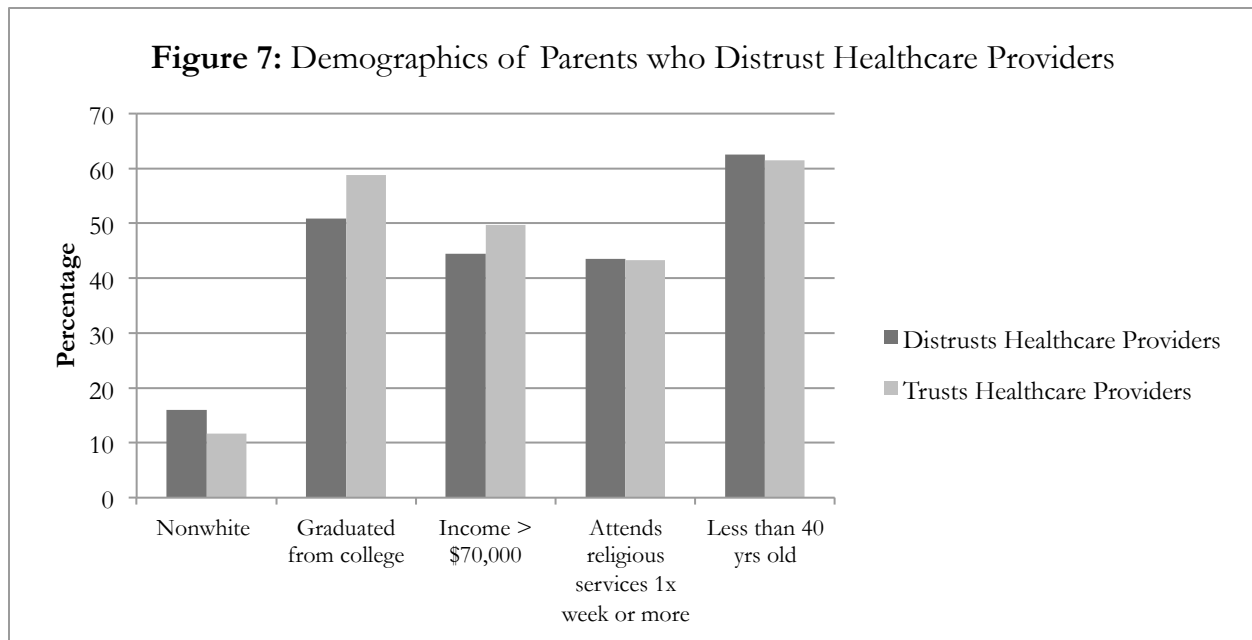
Of the whole study population ($n=1,253$), 40.22% ($n=504$) distrusted the government and 23.86% ($n=299$) of the population distrusted their healthcare providers according to the definitions outlined in the secondary analysis section. A higher proportion of parents who distrust the government were of nonwhite race compared with parents who trust the government (17.66% vs 9.35%, respectively; $P=0.000$; **Figure 6**).



Those who distrust the government tended to have lower levels of education, graduating from college less often than those who trust the government (50.99% vs 60.88%, respectively; $P=0.001$). A smaller proportion of parents who distrust the government were of an income level above the median [\$60,000-69,999] when compared to those who trust the government (42.86% vs 52.20%, respectively; $P=0.001$). Level of religiousness was similar in terms of proportion who attend religious services once a week or more (distrust government vs trust government: 43.66% vs 42.86%, respectively; $P=0.779$). Parents who distrust the

government tended to be younger than parents who trust the government, with a higher proportion at the median age [36-40 years] or lower (65.67% vs 59.15%, respectively; $P=0.020$).

Parents who distrust their healthcare providers were more likely to be nonwhite than those who trust healthcare providers (16.05% vs 11.64%, respectively; $P=0.045$; **Figure 7**).



They were also less likely to graduate from college than parents who trust their providers (50.84% vs 58.81%, respectively; $P=0.015$). The income level for those who distrust and trust their healthcare providers had similar proportions of those with high incomes (44.48% vs 49.69%, respectively; $P=0.116$). Level of religiousness was similar across both groups based on proportion who attend religious services once a week or more (distrust healthcare provider vs trust healthcare provider: 43.48% vs 43.29%, respectively; $P=0.955$). Age for those who distrust and trust their healthcare providers was similar, with near equal proportions at the median age or lower (62.54% vs 61.53%, respectively; $P=0.753$). Overall,

both distrust populations tended to be more nonwhite and of lower education level. Parents who distrust the government were also more likely to be younger and have lower incomes.

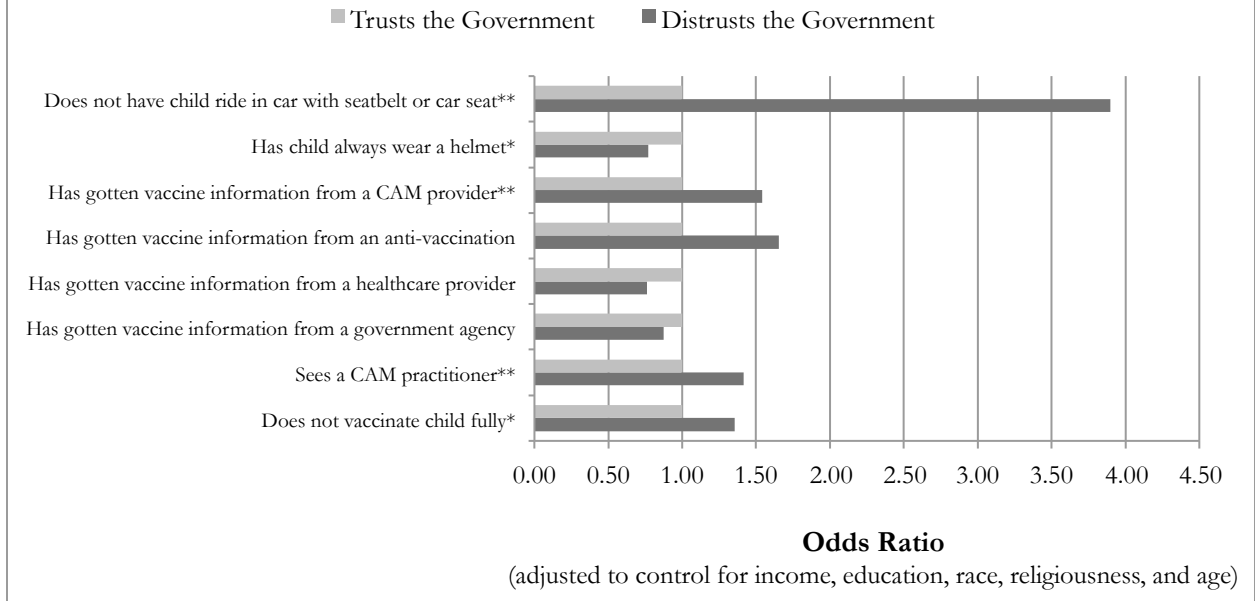
This analysis looked at the variation in eight parental safety behaviors between distrust and trust populations (**Table 2**). The variation in 13 parental safety beliefs was also analyzed between distrust and trust populations (**Table 3**). Those who distrust the government were significantly more likely not to vaccinate their children fully and be granted a vaccine requirement exemption¹ than those who trust the government (24.80% vs 20.29%, respectively; odds ratio [OR], 1.35; 95% confidence interval [CI], 1.03-1.78; **Figure 8**). Similarly, those who distrust their healthcare providers were more likely not to vaccinate their children fully than those who trust their providers (35.79% vs 17.8%, respectively; OR, 2.63; 95% CI, 1.96-3.52; **Figure 9**). Both distrust populations were more likely to see a complementary/alternative medicine provider.

Both distrust populations were more likely than the trust populations to think government sources of information about vaccines were unreliable, categorizing the CDC, the FDA, or local & state health departments as poor or very poor sources (distrusts the government vs trusts the government: 20.44% vs 10.81%, respectively; OR, 2.05; 95% CI, 1.48-2.82; **Figure 10**; distrusts healthcare providers vs trusts healthcare providers: 25.75% vs 11.22%, respectively; OR, 2.67; 95% CI, 1.92-3.71; **Figure 11**). Those who distrust their healthcare providers were more likely to distrust vaccine information acquired at their providers' office than those who trust providers, whether information consists of verbal

¹ Note that in Massachusetts and Missouri PBEs are not allowed, but religious exemptions are. The study showed that this religious exemption option was demonstrably used for nonreligious reasons. In 91% and 77% of nonmedical exemptions in these states, respectively, parents did not report religious reasons for the exemptions [50].

advice or printed materials (16.05% vs 3.46%, respectively; OR, 5.25; 95% CI, 3.28-8.40). Conversely, both distrust populations were more likely than the trust populations to consider the antivaccine organization Dissatisfied Parents Together (DPT) a reliable source for vaccine information, categorizing DPT as a good or excellent source. Those who distrust the government were also more likely to find vaccine information from CAM providers reliable than those who trust the government, classifying them as a good or excellent source.

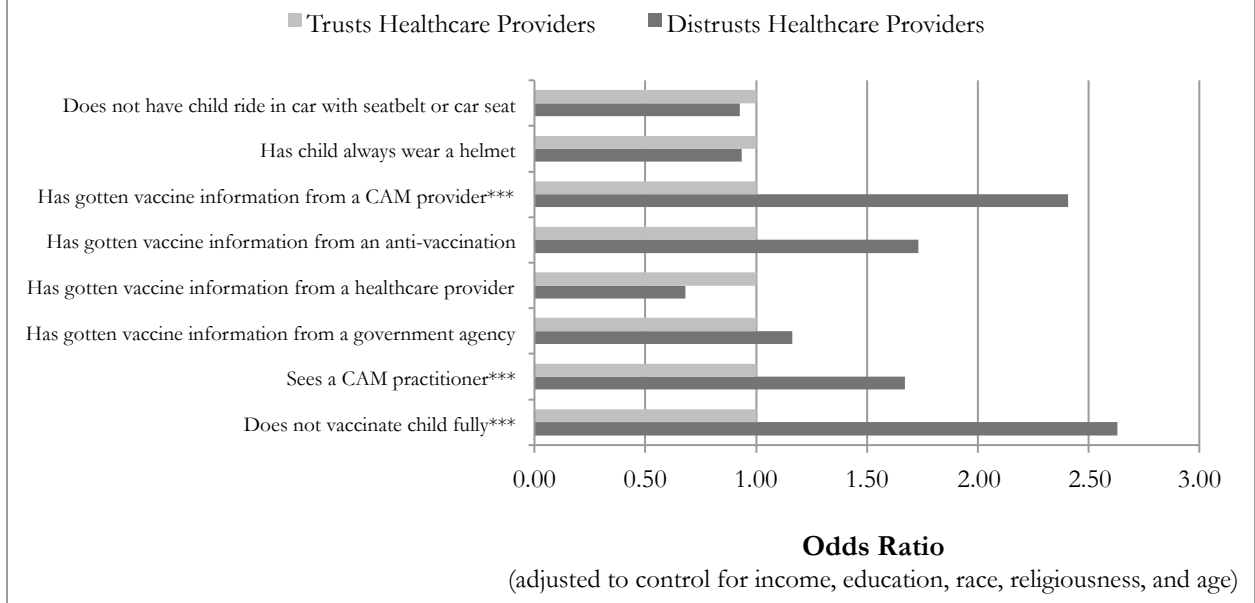
Figure 8: Behaviors of Parents who Distrust the Government



* p<0.05, ** p<0.01, ***p<0.001

All odds ratios and confidence intervals are adjusted to control for income, education, race, religiousness, and age.

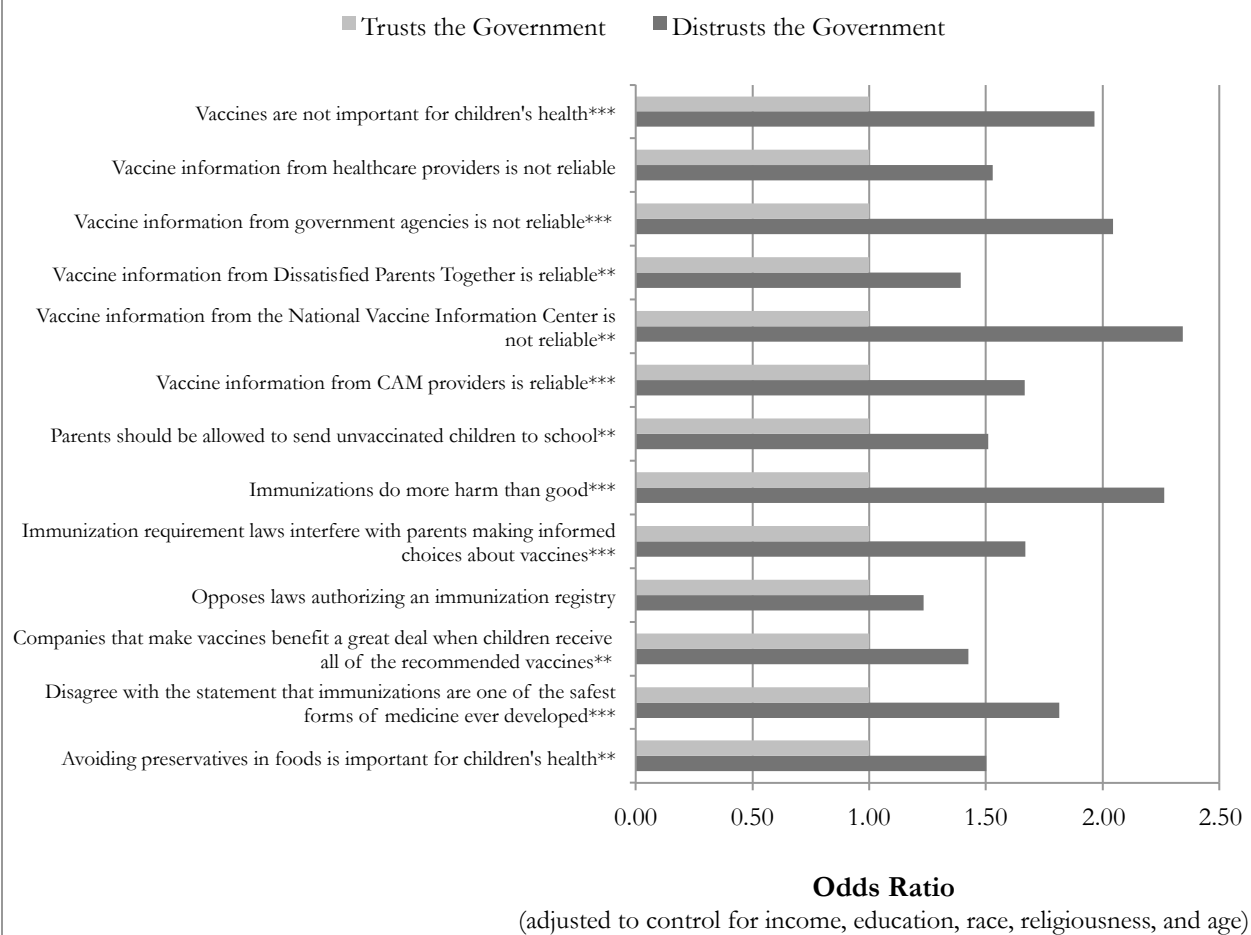
Figure 9: Behaviors of Parents who Distrust Healthcare Providers



* p<0.05, ** p<0.01, ***p<0.001

All odds ratios and confidence intervals are adjusted to control for income, education, race, religiousness, and age.

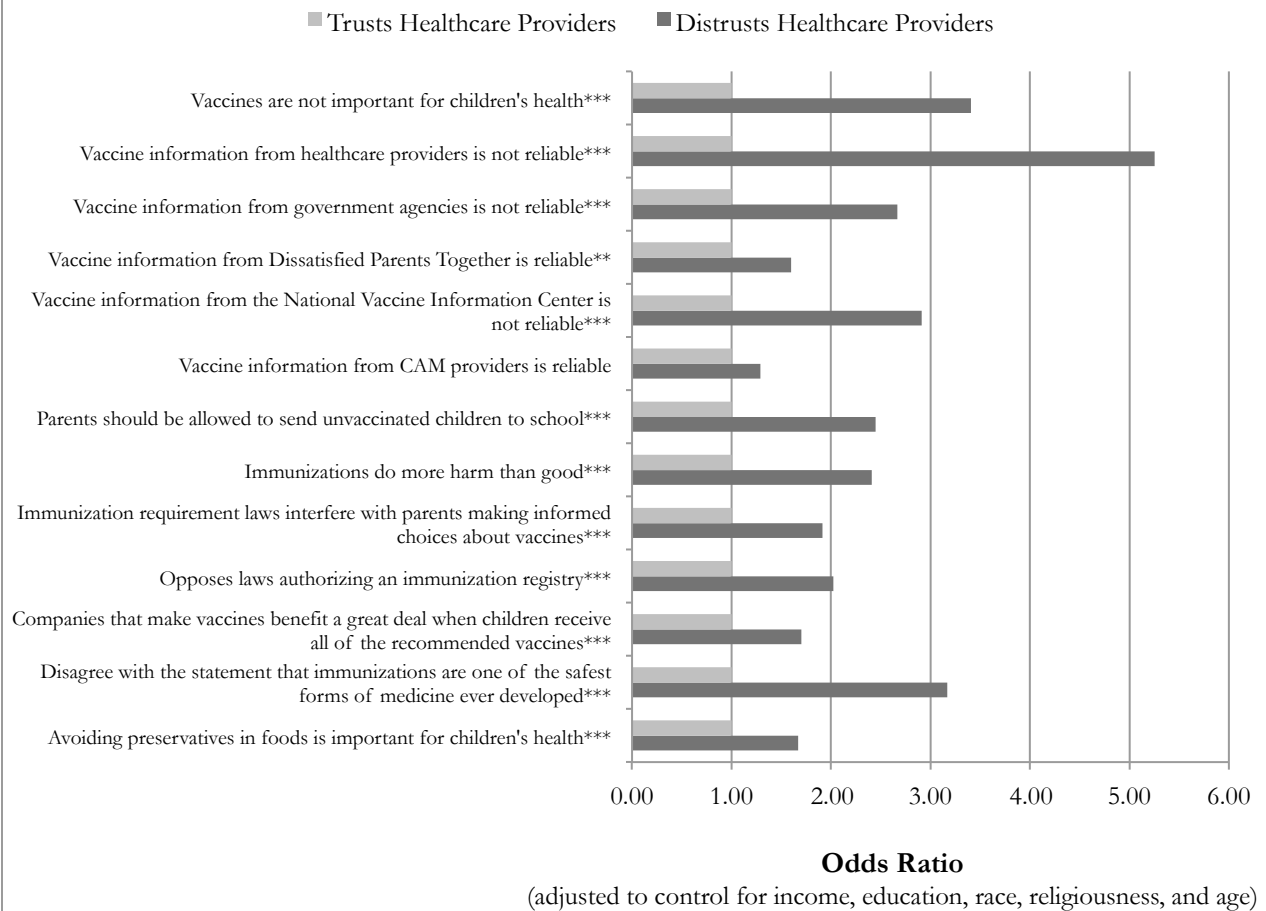
Figure 10: Beliefs of Parents who Distrust the Government



* p<0.05, ** p<0.01, ***p<0.001

All odds ratios and confidence intervals are adjusted to control for income, education, race, religiousness, and age.

Figure 11: Beliefs of Parents who Distrust Healthcare Providers



* p<0.05, ** p<0.01, ***p<0.001

All odds ratios and confidence intervals are adjusted to control for income, education, race, religiousness, and age.

Table 2. Behavior Differences in Parent Populations who Distrust the Government or Healthcare Providers

Behavior	Distrusts the government			Distrusts healthcare provider		
	OR	P-value	95% CI	OR	P-value	95% CI
Does not vaccinate child fully	1.35	0.031*	1.03-1.78	2.63	0.000***	1.96-3.52
Sees a CAM practitioner	1.42	0.004**	1.12-1.79	1.67	0.000***	1.27-2.20
Has gotten vaccine information from a government agency	0.87	0.246	0.69-1.10	1.16	0.261	0.89-1.51
Has gotten vaccine information from a healthcare provider	0.76	0.388	0.41-1.41	0.68	0.249	0.35-1.31
Has gotten vaccine information from an anti-vaccination organization	1.65	0.022*	1.08-2.54	1.73	0.017*	1.10-2.72
Has gotten vaccine information from a CAM provider	1.54	0.005**	1.14-2.07	2.41	0.000***	1.76-3.29
Has child always wear a helmet	0.77	0.030*	0.61-0.98	0.94	0.629	0.72-1.22
Does not have child ride in car with seatbelt or car seat	3.90	0.005**	1.50-10.12	0.93	0.881	0.34-2.55

* p<0.05, ** p<0.01, ***p<0.001

All odds ratios and confidence intervals are adjusted to control for income, education, race, religiousness, and age.

Table 3. Belief Differences in Parent Populations who Distrust the Government or Healthcare Providers

Belief	Distrusts the government			Distrusts healthcare provider		
	OR	P-value	95% CI	OR	P-value	95% CI
Vaccines are not important for children's health	1.96	0.000***	1.37-2.81	3.41	0.000***	2.37-4.90
Vaccine information from healthcare providers is not reliable	1.53	0.070	0.97-2.42	5.25	0.000***	3.28-8.40
Vaccine information from government agencies is not reliable	2.05	0.000***	1.48-2.82	2.67	0.000***	1.92-3.71
Vaccine information from Dissatisfied Parents Together is reliable	1.39	0.005**	1.11-1.76	1.60	0.001**	1.23-2.09
Vaccine information from the National Vaccine Information Center is not reliable	2.34	0.006**	1.28-4.30	2.91	0.000***	1.61-5.28
Vaccine information from CAM providers is reliable	1.67	0.000***	1.32-2.10	1.29	0.057	0.99-1.68
Parents should be allowed to send unvaccinated children to school	1.51	0.001**	1.19-1.91	2.45	0.000***	1.88-3.19
Immunizations do more harm than good	2.26	0.000***	1.65-3.11	2.41	0.000***	1.74-3.34
Immunization requirement laws interfere with parents making informed choices about vaccines	1.67	0.000***	1.30-2.15	1.91	0.000***	1.45-2.52
Opposes laws authorizing an immunization registry	1.23	0.091	0.97-1.57	2.03	0.000***	1.55-2.65
Companies that make vaccines benefit a great deal when children receive all of the recommended vaccines	1.43	0.005**	1.11-1.83	1.70	0.000***	1.26-2.29
Disagree with the statement that immunizations are one of the safest forms of medicine ever developed	1.81	0.000***	1.39-2.37	3.17	0.000***	2.38-4.22
Avoiding preservatives in foods is important for children's health	1.50	0.001**	1.19-1.90	1.67	0.000***	1.28-2.19

* p<0.05, ** p<0.01, ***p<0.001

All odds ratios and confidence intervals are adjusted to control for income, education, race, religiousness, and age.

DISCUSSION

Of my six initial hypotheses, four (I, II, III, and V; **Figure 12**) were confirmed fully for both people who distrust the government and healthcare providers, one was confirmed for those who distrust healthcare providers (IV), and one was rejected (VI) and even proved significant in the opposite direction. People who distrust the government and healthcare providers do

refuse vaccination more often, have increased concern that vaccines cause harm, see CAM providers more often, and obtain their vaccination information from nongovernmental, nonscientific sources more often than those who do not distrust either of these entities. Those who do distrust the government and healthcare providers tend to oppose vaccination requirement laws and those who distrust healthcare providers oppose immunization registry laws more often. Additionally, distrusting populations question the accuracy of vaccine information from the government and from their healthcare providers. They tend to think immunizations are not very safe but actually do harm and that children should be allowed to go to school unvaccinated.

Unexpectedly, parents who distrusted the government were less likely to have their children always wear a helmet or always wear a seatbelt (or use a car seat or booster seat).

Figure 12

Hypotheses

My hypothesis is that distrust of government and distrust of healthcare providers are significant factors in parental health and safety decisions, specifically associated with:

- I. Increased rates of vaccine refusal
- II. Increased concern that vaccines cause harm
- III. Increased use of complementary/alternative medical (CAM) practitioners
- IV. Increased opposition of immunization registries and laws requiring immunizations in schools
- V. Increased use of nongovernmental, nonscientific, and anti-vaccine sources of information on immunizations
- VI. Increased bike helmet usage, increased seatbelt usage, and increased concern about food preservatives

The original hypothesis was based on the idea that the distrust populations would be generally more protective of their children from all external risks, increasing safety conscious decisions like seatbelt usage and helmet wearing. However, these results conflict with that logic and conclusion. Instead the outcome suggests that parents who distrust the government resist government requirements and interventions in general, directly opposing the prescription of safety behaviors through laws. Both distrust populations were more likely to be concerned about artificial preservatives in food, which was the other safety belief unrelated to vaccines. This result suggests that distrusting parents do not trust the government to protect their children, for example in the case of preservative concerns not trusting the FDA to protect food sources. This distrusting population may deliberately choose to do the opposite of what the government requires (not vaccinate their children and not have their children wear seatbelts or helmets) in part purely because they resent the fact that the government requires it.

Another demonstration of distrust populations opposing an idea when it is associated with the government was shown by the results surrounding vaccine information questions. When asked to choose what sources of vaccine information would be accurate (even if the respondent was not familiar with the source), both distrust populations responded that the National Vaccine Information Center (NVIC) is a poor or extremely poor source, but that Dissatisfied Parents Together (DPT) is a good or excellent source. The NVIC is, however, simply the new name for DPT. Their new "official" sounding name seems to inspire skepticism in those who distrust, presumably due to the word "National" in the title.

Notably, there was no significant difference between distrust and trust populations in the likelihood of having received vaccine information from the government or healthcare

providers. 44.64% of those who distrust the government and 47.53% of those who trust the government have received information about immunizations from the CDC, FDA, or their local or state health departments (49.50% and 45.39% for the healthcare distrust/trust populations respectively). 95.32% of those who distrust their healthcare providers and 96.86% of those who trust their healthcare providers have received vaccine information through advice from their providers or through printed materials at their providers' offices (95.83% and 96.93% for the government distrust/trust populations respectively). Essentially, around half of all parents have received vaccine information from a government source and nearly all parents have received this information from their healthcare providers. A disparity in exposure to accurate vaccine information is not the issue for this population. The concern, rather, is that both distrust populations believe government information about immunizations is unreliable more often than trust populations. Those who distrust their healthcare providers also believe vaccine information from their healthcare providers is unreliable more often than those who trust their providers.

This layer of skepticism and suspicion means that no matter how sound the statistics about vaccine safety may be, because this population inherently distrusts the source of the information more often, they will be less likely to be convinced by immunization information from the government (or their healthcare providers in the case of those who distrust providers). Nyhan shows, in a recent, rather frustrating study, that antivaccinators are not convinced to vaccinate even when they are presented with scientifically proven facts about vaccination and the harm that can come from vaccine preventable diseases. In fact, they sometimes take an even stronger antivaccination standpoint after being exposed to a dramatic narrative about an infant who almost died from measles from a CDC fact sheet.

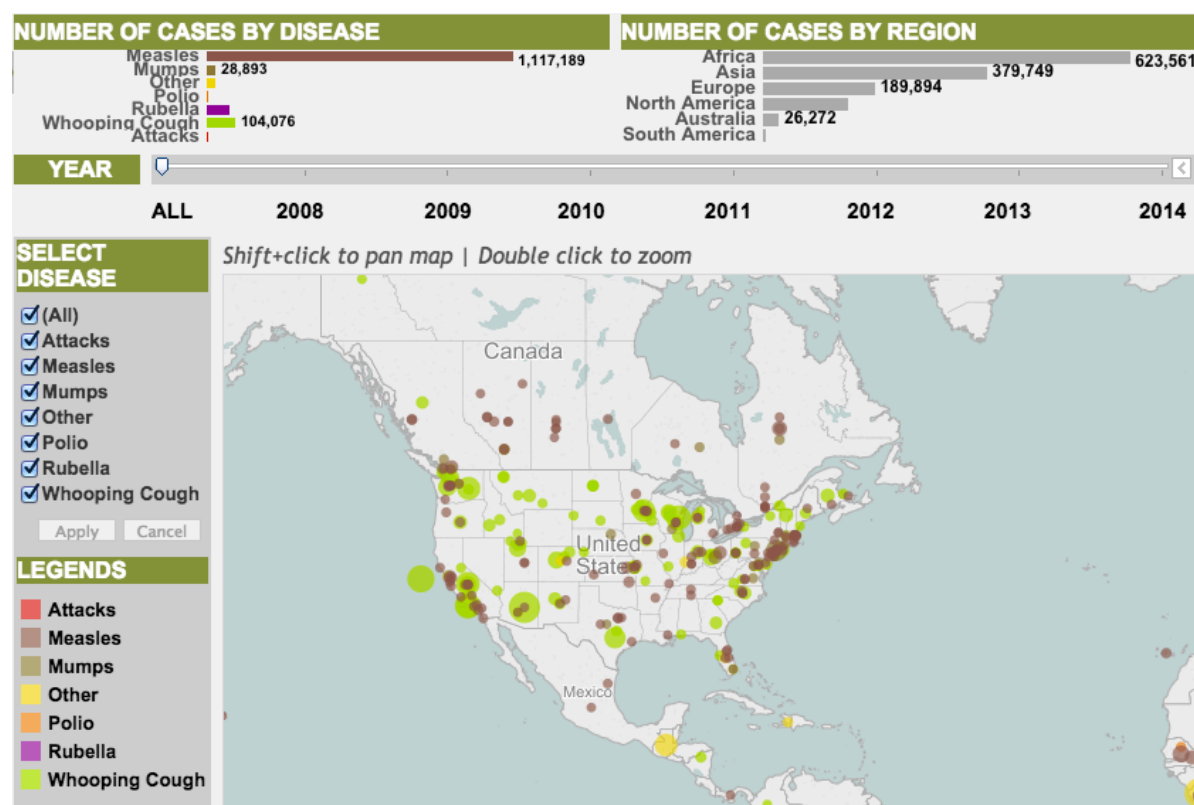
The study concludes that current public health communications about immunizations may not be effective in encouraging parents to vaccinate, and may even backfire in some instances.⁵⁸ My results coincide with Nyhan's, providing a plausible explanation for why these communication mechanisms are ineffective: underlying distrust of the sources.

The essential implications of my results are that there is a group of people who distrust the government and/or their healthcare providers. These people tend to vaccinate less. They are not as responsive to governmental or scientific information about vaccines. This means that PSAs, health office leaflets debunking myths about vaccines, CDC flyers about the safety of specific vaccines, etc. will most likely not convince this population that they should vaccinate their children. Public funding spent on these campaigns is not generating maximum returns with this distrust population. While current public health communications may be valuable in supporting certain non-distrusting populations that they should vaccinate, these populations may vaccinate fully on their own without this information. The distrust population will most likely need to be reached through modalities outside of traditional government and healthcare provider communications. Research into new effective techniques for delivering pro-vaccine messages is warranted. Innovative methods to reach this distrustful population could include widespread vaccine negotiation training for healthcare providers in health professional school curriculums, specifically emphasizing the importance of developing trust with parents. Local initiatives to create parental peer advocate programs for vaccines through school Parent-Teacher Associations, professional groups, or religious groups could better access the antivaccine population by engaging a social network and using beneficial peer pressure. Increased collaboration and

communication between public health officials and CAM practitioners may also improve vaccination rates.

The current state of affairs is that more states are passing PBE legislation and more parents are seeking exemptions for their children's required vaccinations ². Without public health interventions, this momentum can lead to pockets of vulnerable unvaccinated children defenseless in the face of outbreaks. It only takes one unvaccinated child to import a vaccine preventable disease from a family trip abroad to cause an outbreak. With recent national outbreaks of measles and whooping cough, importation is no longer necessary for cases to spread regionally. Measles and whooping cough outbreaks in the United States over the past six years are disturbingly common (**Figure 13**).⁵⁹

Figure 13



Steps must urgently be taken to increase vaccination rates, improve herd immunity, and prevent future outbreaks of vaccine-preventable diseases.

LIMITATIONS

As with any statistical analysis done on observational data not part of a randomized trial, the analysis performed on this data is unable to definitively prove causation, but can show association and correlation of outcomes. The distrust categories used as independent variables could cause the beliefs and behaviors to be more or less likely as hypothesized, or the distrust could in fact be the outcome caused by the beliefs and behaviors described.

Though the study subject selection process was randomized as much as possible, somehow the race diversity of the final population of respondents was limited, being mostly white with only 12.69% nonwhite parent respondents. This distribution is not an accurate representation of the race diversity in this country. This dominantly white study population could affect results, namely because research has shown a relationship between race and distrust. The study did not collect data from any southern states or from homeschooled children, where religion may play more of a role in distrust and deciding not to vaccinate. The categorization of income in this study used \$70,000 and above as the highest possible income bucket. The income also was not adjusted for the number of people in the household. Because the experiences of a family of 3 that has an income of \$150,000+ per year and a family of six that has an income of \$80,000 per year would be vastly different, the ability to control for income was limited in this analysis. A nonresponse bias may have affected results, because parents who did not fully vaccinate were less likely to respond to the survey than parents who did. More information about vaccine opposition could have been elucidated from those missed responses.

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